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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/820,675	03/29/2001	James Patrick Quaile	RD-28,220	3578

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GENERAL ELECTRIC COMPANY
GLOBAL RESEARCH
PATENT DOCKET RM. BLDG. K1-4A59
NISKAYUNA, NY 12309

EXAMINER	
BORLINGHAUS, JASON M	

ART UNIT	PAPER NUMBER
3628	

DATE MAILED: 06/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/820,675	Applicant(s) QUAILE ET AL.	
	Examiner Jason M. Borlinghaus	Art Unit 3628	

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 March 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 July 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *3/29/01*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

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DETAILED ACTION

Claim Objections

Claims 5 - 6, 15 and 22 are objected to because of the following informalities: missing parentheses in equation. Applicant claims the equation listed below:

$$\text{Base\_Credit\_Line} = [(IHC)L_1 + [(AVGHCy_1 + (HC)\ y_2]L_2$$

Examiner suggests that applicant add the missing parentheses in order to claim the equation listed below:

$$\text{Base\_Credit\_Line} = [(IHC)L_1 + [(AVGHC\underline{)}y_1 + (HC)\ y_2]L_2$$

Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1 - 2, 7, 9 -12, 16 and 19 - 21 are rejected under 35 U.S.C. 103(a) as being obvious over Tom (US Patent 5,832,465) in view of Mays (Mays, Elizabeth. *Credit Risk Modeling: Design and Application.* Glenlake Publishing Company, Ltd. 1998).

Regarding Claim 1 -2, 12 and 21, Tom discloses a computerized method comprising:

- collecting financial data for said applicant entity. ("A plurality of examples are collected from a plurality of previously approved financial service applications." - see col. 2, lines 38 - 40);
- processing the collected financial data to determine credit score (worthiness). ("The plurality of examples are organized into a plurality of groups used to perform risk and credit analysis." - see col. 2, lines 42 - 44). ("In the spreadsheet of FIG. 3a, the output processing node is credit worthiness. The possible set of linguistic evidential values for the credit worthiness output processing node are "strong", "medium", and "weak"." - see col. 5, lines 12 - 16);
- adjusting (weighting) said credit score based on the output from an evidential reasoning tool (processing node) to determine the credit risk to be assigned to the applicant entity. ("A weighting function is determined for each processing node for aggregating the evidential numeric values into an evidential numeric aggregate value. The weighting functions for

- each of the processing nodes in the model structure are optimized until there is minimal error between the final output and the desired output for the plurality of examples." - see col. 2, lines 53 - 58); and
- said processing step is performed using a respective processing mode depending on the type of financial data available. ("In the illustrative embodiment, the input layer comprises five processing nodes that each receive different linguistic evidential data according to a specific group. For example, processing node Y_1 receives linguistic evidential data for the employment stability ... group, processing node Y_2 receives linguistic evidential data-for the residence stability group, processing node Y_3 receives linguistic evidential data-for the credit history group, processing node Y_4 receives linguistic evidential data ... for the debt and income group, and processing node Y_5 receives linguistic evidential data...for the miscellaneous group." - see col. 4, lines 1 - 13).

Tom does not teach a computerized method comprising:

- processing the collected financial data to determine <u>base amount of credit limit;</u> and
- adjusting said <u>base credit line</u> based on the output from an evidential reasoning tool to determine <u>the credit line to be issued</u> to the applicant entity.

Mays discloses a computerized method comprising:

- collecting data. ("Back propagation neural networks typically have at least three interconnected levels. The first layer is made up of network inputs." - see page 150, Data Mining);
- processing the collected data to determine a credit score. ("Though they are the same as those used in traditional regression models, they are now called predictor variables. The middle layer contains processing elements that include transfer functions allowing neural networks to model nonlinear data. The third layer produces the neural network output, the predicted outcome - better known as the score... Using the input information contained in the predictor variables, the neural network mathematically estimates an outcome. (e.g. good or bad loan)." - see page 150-151, Data Mining);
- adjusting (weighting) said credit score based on the output from an evidential reasoning tool to determine the credit score to be assigned to the entity. ("During model development the neural network calculates weight values for all the interconnections among the processing elements. These weights in turn used to calculate the score." - see page 152, Data Mining); and
- using credit score to determine base amount credit limit. ("Credit scores can also be used in the new account stage to determine the terms of an account, such as credit limits and minimum payments for revolving credit

accounts or choice of collateral and repayment period for installment loans." - see page 32, Using Consumer Credit Information).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Tom which calculates a credit score by incorporating the ability to convert credit scores into a proposed credit limit, as disclosed by Mays, in order to provide a faster method for determining the amount of a credit line.

Regarding Claims 7 and 16, Tom discloses a computerized method wherein:

- the output from said tool comprises a linguistic output indicative of the level of credit risk for said applicant. ("The linguistic evidential output value from each input processing node in the input layer is then inputted to the output layer processing node (i.e., credit worthiness), where the linguistic evidential values generated there from are translated to a numeric value. Again, the evidential numeric values correspond to the linguistic evidential values and have values ranging between -1.0 and 1.0... If the linguistic evidential data for the credit history node is "poor", then the numeric evidence value is -0.3...After the linguistic evidential values have been translated to numeric values, then the values are aggregated to a final evidential output value using an evidence aggregation function. The aggregated evidential value will also have a value in the range between -1.0 and 1.0. Next, the evidential aggregation value is mapped to a linguistic evidential value using a mapping function. One possible mapping for the credit worthiness output processing node is if the aggregate

evidential value is greater than 0.7, then the linguistic evidential output value is "strong". Other possible mappings are if the aggregate evidential value is between -0.6 and 0.7, then the linguistic evidential output value is "medium" and if the aggregate evidential value is less than -0.6, then the linguistic evidential output value is "weak". Essentially, the final linguistic evidential output value recommends whether the financial service application should be accepted or denied." - see col. 6, line 44 - col. 7, line 11.)

Regarding Claim 9, Tom discloses a computerized method wherein:

- the credit score issued to the applicant comprises the addition of credit-related variables ("...the numeric values are combined using an evidence aggregation function." - see col. 6, lines 28 - 36) and application of a respective adjusting factor (weighting function). (supra).

Tom does not teach a computerized method wherein:

- the credit line issued to the applicant comprises the product of the base credit line and the respective adjusting factor.

Mays discloses a computerized method wherein:

- the credit score issued to the applicant comprises various transformations of credit-related variables ("With linear regression, the size and signs of the coefficients (the weights of each variable) can be examined for reasonableness. With a highly non-linear regression that has many interaction terms, or with a neural network, a sensitivity analysis of the

contribution of each variable is required, and the variable must be examined across a range of values ... Often, transforming variables before they are included in the model improves predictive power ... Variables are also created through summation ... These transformations, while affecting the model, are sometimes decisions the modeler inherits from the creators of the data set if the original underlying variables are no longer available. Other types of transformations include powers, logs, exponentials, or other functions of the independent variables ... These transformations can improve the power of the model if the underlying variable enters in a non-linear way." - see page 98 - 99, Optimal Use of Statistical Techniques in Model Building).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Tom to allow for any transformation of the data that the inventor desired, as Mays illustrates, to obtain the desired result. Tom claimed to produce a credit score comprising the addition of credit-related variables and application of an adjusting factor, it would have been obvious to have modified Tom to have multiplied the credit-related value by the adjusting factor, and converting such product into a credit limit.

Regarding Claims 10 -11 and 19 - 20, Tom does not teach a computerized method wherein said financial data comprises:

- historical data accumulated by said service provider; and
- externally-derived financial data.

Mays discloses a computerized method wherein said financial data comprises:

- historical data accumulated by said service provider; and
- externally-derived financial data. ("An important aspect of developing the optimal model is to access data from a variety of sources, both internal and external, and then clean and organize it ... Data used in assessing prospect or customer risk can come from a variety of sources. Typically, credit bureau, masterfile, application, and a combination of application and demographic data are used." - see page 172, Case Studies in Credit Risk Model Development).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Tom to receive financial data from internal and external sources, as disclosed by Mays, to provide multiple sources for data for system analysis.

Claims 3 - 6, 8, 13 -15, 17 - 18 and 22 are rejected under 35 U.S.C. 103(a) as being obvious over Tom and Mays, as in Claims 1, 12 and 21, above, and in further view of Edwards (Edwards, Burt. *Credit Management Handbook 4th Edition.* Gower Publishing Limited. 1997) and Goonatilake (Goonatilake, Suran & Treleaven, Philip. *Intelligent Systems for Finance & Business.* John Wiley & Sons. 1995).

Regarding Claims 3 - 6, 13 -15 and 22, Tom discloses a computerized method wherein:

- said financial data is selected from the group consisting of income and credit variables. ("The linguistic evidential data in the income and debts group ... may include disposable income, income/capitalized vehicle cost ratio, mortgage/long term debt ratio, debt to income ratio. The linguistic evidential data in the credit history group ... may include number of credit bureau inquiries, number of accounts too new to rate, number of derogatory remarks, number of accounts 30 days late, number of accounts 60 days late, number of accounts 90 days late, number of bank loans, number of finance loans, and number of revolving loans." - see col. 4, lines 21 - 30); and

- the processing of said financial data to determine the credit score has the income and credit variables are added and weighting factors are applied. ("A weighting function is then determined for each processing node and used to aggregate the evidential numeric values into an evidential numeric aggregate value." - col. 2, lines 53 - 55).

Tom does not teach a computerized method wherein:

- said financial data is selected from the group consisting of <u>Tangible Net Worth Working Capital Average High Credit High Credit and Internal High Credit</u>;
- the processing of said financial data to determine the base credit line is based on the following equation:

$Base\_Credit\_Line = [(TNW)\alpha_1 + (WC)\alpha_2]K_1 + [(AVGHC)\alpha_3 + (HC)\alpha_4]K_2$

wherein TNW = Tangible Net Worth; WC = Working Capital; AVGHC = Average High Credit; HC = High Credit; and K_i, K_2, α, - α_4 represent weighting factors;

- the processing of said financial data to determine the base amount is based on the following equation:

  $Base\_Credit\_Line = (IHC)L_1 + [(AVGHC)y_1 + (HC)\ y_2]L_2$

  wherein IHC = Internal High Credit; AVGHC = Average High Credit; HC = High Credit; and L_1, L_2, y_1 and y_2 represent weighting factors; and

- the processing of said financial data to determine the base amount is based on the following equation:

  $Base\_Credit\_Line = [(TNW)\alpha_1 + (WC)\alpha_2]K_1 + [(AVGHC)\alpha_3 + (HC)\alpha_4]K_2$

  wherein TNW = Tangible Net Worth; WC = Working Capital; AVGHC = Average High Credit; HC = High Credit; and K_1, K_2, α, - α_4 represent weighting factors, and in the absence of Tangible Net Worth or Working Capital data, said base amount for the credit line is based on the following equation:

  $Base\_Credit\_Line = (IHC)L_1 + [(AVGHC)y_1 + (HC)\ y_2]L_2$

  wherein IHC = Internal High Credit; AVGHC = Average High Credit; HC = High Credit; and L_1, L_2, y_1 and y_2 represent weighting factors.

Mays discloses a computerized method wherein:

- said financial data is selected from the group consisting of income and credit variables. ("Optimization of any approach requires including all the relevant variables. For credit risk modeling, depending on the type of risk, there are several categories of variables from which variables may be selected: credit history, borrower characteristics, loan characteristics, collateral characteristics, economic conditions, and, for international loans, country risk. If variables excluded from the system affect the risk, then the predictive power of the resultant model will not be as high as it could be." - see page 68, Optimal Use of Statistical Techniques in Model Building);
- consultation of credit information from the group consisting of Average High Credit and Internal High Credit. ("Finally, a snapshot view is provided under the Credit Summary, listing data by the type of credit (installment, revolving, etc.), high credit, credit limit, balance, past due amount, and monthly payment available. High credit is the highest outstanding balance a cardholder account has ever had." - see page 26, Using Consumer Credit Information); and
- the processing of said financial data to determine the credit score has the income and credit variables are added and weighting factors are applied. ("Often, transforming variables before they are included in the model improves predictive power ... Variables are created through summation ... Other types of transformations include powers, logs, exponentials, or other

functions of the independent variables." - see page 99, Optimal Use of Statistical Techniques in Model Building. "During model development the neural network calculates weight values for all interconnections among the processing elements. The weight values do not change when the score is displayed in production." - see page152, Data Mining).

Edwards discloses a computerized method wherein:

- said financial data is selected from the group consisting of Tangible Net Worth and Working Capital. ("Where the maximum debt level is used, as in the second method, a typical approach is to take a proportion of the customer's known financial worth, such as the lesser of 10% of net worth or 20% of working capital, with an overriding maximum such as 20% of total creditors - it is normally unwise to become too prominent a creditor." - see page 104, How to Decide and Use Credit Ratings and Risk Categories).

Goonatilake discloses a computerized method wherein:

- the processing of said financial data to determine the credit risk continues in the absence of financial data. ("The system will form groupings using customer information which is usually incomplete or inconsistent. It is very common to find errors in large customer databases due to data entry mistakes. Some of the data entries may be incomplete because it is too costly to collect all the relevant data (e.g. ratings from a credit agency). Nevertheless, an intelligent system used to learn such groupings can generalize from the majority of records it has been seen before and can

offer a flexibility in its reasoning in a manner similar to the way professionals use and produce such groupings." - see page 6, Intelligent Systems for Finance & Business: An Overview).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Tom to accept any relevant financial data and to allow for any transformation of the data that the inventor desired, as Mays illustrates, to obtain the desired result. Tom claimed to produce a credit score comprising the addition of credit-related variables and application of a weighting factor, it would have been obvious to have modified Tom for allow for various combinations of the credit-related variables and weights. Additionally, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Tom and Mays to accept any Tangible Net Worth and Working Capital, as disclosed by Edwards, which are standard credit-related variables used in credit calculations and to anticipate the possibility of missing financial data, as is illustrated by Goonatilake, since incomplete data is a standard scenario when calculating credit risk.

Regarding Claims 8 and 17, Tom discloses a computerized method further comprising:

- mapping said output to an equation. ("Once all of the linguistic evidential data values at the input processing nodes have been translated into an evidential numeric value, then the numeric values are combined using an evidence aggregation function... Next, the evidential aggregation value is mapped to a linguistic evidential value using a mapping function." - see

col. 6, lines 28 - 36 - establishing the mapping of output of a processing node to a mathematical function.); and

- said mapping equation possessing a respective adjusting factor (weight function). ("In order to overcome any weaknesses or inefficiencies during the translation of the linguistic evidential values to the numeric values at the inputs of the input layer processing nodes and the mapping of the aggregate numeric value to the linguistic evidential value at the output, this invention combines the numeric to linguistic evidential value mapping at the output of the input layer processing nodes with the linguistic evidential value to numeric translation at the input of the output layer processing node. This is achieved by using a weighting function, S, that is placed after the evidence aggregation function ... In order to map the numeric value to a linguistic evidential value and translate the linguistic evidential value to a numeric value, the weighting function, S, is a stepwise function. In general, the weighting function, S, is a transformation (i.e., linear or nonlinear) from the [-1,1] space to the [-1,1] space. The parameters of the weighting function, S, are called weights, denoted by w." - see col. 8, line 57 - col. 9, line 11.)

Neither Tom nor Mays teach a computerized method further comprising:

- mapping said <u>linguistic output to a</u> respective adjusting factor.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Tom to allow for any transformation of the data

that the inventor desired. Tom claimed to produce a linguistic output from numeric values after mapping such numeric values to an equation that possesses a weighting function, it would have been obvious to have modified Tom to have mapped the linguistic output to an adjusting (weighting) factor directly.

Regarding Claim 18, Tom discloses a computerized method wherein:

- the credit score issued to the applicant comprises the addition of credit-related variables ("...the numeric values are combined using an evidence aggregation function." - see col. 6, lines 28 - 36) and application of a respective adjusting factor (weighting function). (supra).

Tom does not teach a computerized method wherein:

- the credit line issued to the applicant comprises the product of the base credit line and the respective adjusting factor.

Mays discloses a computerized method wherein:

- the credit score issued to the applicant comprises various transformations of credit-related variables ("With linear regression, the size and signs of the coefficients (the weights of each variable) can be examined for reasonableness. With a highly non-linear regression that has many interaction terms, or with a neural network, a sensitivity analysis of the contribution of each variable is required, and the variable must be examined across a range of values ... Often, transforming variables before they are included in the model improves predictive power ... Variables are also created through summation ... These transformations, while affecting

the model, are sometimes decisions the modeler inherits from the creators of the data set if the original underlying variables are no longer available. Other types of transformations include powers, logs, exponentials, or other functions of the independent variables ... These transformations can improve the power of the model if the underlying variable enters in a non-linear way." - see page 98 - 99, Optimal Use of Statistical Techniques in Model Building).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Tom to allow for any transformation of the data that the inventor desired, as Mays illustrates, to obtain the desired result. Tom claimed to produce a credit score comprising the addition of credit-related variables and application of an adjusting factor, it would have been obvious to have modified Tom to have multiplied the credit-related value by the adjusting factor, and converting such product into a credit limit.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The references cited to (Yaghmai, Shahla N. & Maxin, Jacqueline A. *Expert Systems: A Tutorial. Journal of the American Society for Information Science. vol.* 35, iss. 5. September 1984), (Bank, David. *Know Your Customer. Companies have more data on their customers than ever; The trick is how to use it. Asian Wall Street Journal.* New York, NY. June 28, 1999. p.5), (Moody, Janette W., Blanton, J. Ellis & Will, Richard P. *Capturing expertise from experts: The need to match knowledge*

elicitation techniques with expert system types. The Journal of Computer Information Systems. Stillwater. vol. 39, iss. 2. Winter 1998/1999. pp. 89-85) and (Anonymous. *What's Ahead: Artificial Intelligence. Credit Union Management.* Madison. vol. 19, iss. 10. October 1996. p. 22), and these references are considered to be relevant to the claimed invention due to their reference to expert systems, and expert systems that handle financial and credit analysis.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jason M. Borlinghaus whose telephone number is (571) 272-6924. The examiner can normally be reached on 8:30am-5:00pm M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hyung Sough can be reached on (571) 272-6799. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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PRIMARY EXAMINER
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